NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

ENVIRONMENTAL GUIDANCE DOCUMENT

05-029 February 2005

Construction Quality Assurance for CAFO Livestock Waste Control Facility

Construction Quality Assurance (CQA)Plan is required to be included in applications for Construction Approval at all Concentrated Animal Feeding Operations (CAFO). Construction quality assurance consists of both quality assurance and quality control.

Quality control is a planned system of activities, or the use of such a system, to provide a level of quality that meets the needs of the users. The objective of quality control is to provide construction that is safe, adequate, dependable, and economical.

Quality assurance also is a planned system of activities, but the purpose is to provide assurance that the overall quality control program is being effectively implemented. Quality assurance activities involve verifications, audits, and evaluation of the quality factors that affect the specification, production, inspection, and use of the livestock waste control facility (LWCF).

For CAFOs, a written CQA plan, must be included in applications for a Construction Approval under Title 130 – *"Livestock Waste Control Regulations."* A construction quality assurance plan should provide for a construction report documenting that the LWCF was constructed in accordance with the Construction Approval.

The definition of a "livestock waste control facility" can be found in Title 130, Chapter 1, 025. LWCF structures include, but are not limited to, holding ponds, debris basins, liquid manure storage pits, lagoons, deep underfloor pits, and other devices utilized to control livestock waste.

The CQA must include all items to be reviewed and approved in the application. For example, inlet and outlet elevations of piping, pipe size, debris basin dimensions and grades, holding pond dimensions and grades, soil liner permeability and thickness, concrete construction (including verification of placement and joint sealing), recycle flush systems, lift stations, and any other facility structures used to control livestock waste should be documented in the CQA. Also, diversions used to control or divert drainage should be documented as part of the LWCF. A construction certification should be included in the report.

Some of the items mentioned above may be adequately documented by observation, while some, such as elevations, will require measurements or survey. Many questions arise as to the methods to verify the liners of holding ponds, waste storage pits and lagoons for both earthen construction

and those lined with flexible membrane liners (FML), such as high density polyethylene (HDPE). The following information should be included in the CQA Plan:

1) A clear statement of the authority and lines of authority between contractors, CQA personnel, design engineer, and the owner.

2) A description of any specialized skill and or work qualifications required for CQA personnel.

3) A description of observation and oversight duties, or critical work times when CQA personnel must be on-site.

4) A description of test procedures, frequencies, reporting and acceptance/rejection criteria, as well as descriptions of methods to determine and document corrective work.

The following sections address some of the specific information needed for construction of an earthen liner or FML. Before the liner is installed, the excavation should be evaluated structurally and to make sure the dimensions are correct. The sub-grade acceptability should be documented prior to the installation of the liner.

EARTHEN LINER

For earthen liner design, the application should include a description of the soil materials to be utilized, the location of the material, an estimate of the amount of material available, and a description of the soil properties. Specifications for placement of the materials to meet the percolation requirements of Title 130 must also be included. The designer should evaluate the availability of adequate quantities of the material and the adequacy of the material to limit seepage. A margin of safety should be considered in the design.

Much of this information must be obtained from soil samples obtained during the site evaluation with the use of test pits and/or soil borings. Index tests such as Atterberg limits and gradation can be utilized to select material for further testing and to develop methods to ensure proper materials are utilized during liner construction. Moisture/density tests and hydraulic conductivity tests are used to quantify material to design the appropriate liner. The CQA Plan must include:

1) A description of the methods used to select earthen material for construction and any testing required of borrow material.

2) A description of the placement of the liner material. Generally, loose lifts of 8 to 9 inches are placed, then compacted to approximately 6 inches. For clay soils, compacted lifts generally should be less than the working depth of the compaction equipment. Previously compacted lifts are scarified 1 to 2 inches in depth prior to placement of the next lift to ensure bonding between lifts. This type of information and appropriate documentation should be included in the CQA Plan.

3) Verification of the constructed liner by moisture and density testing. The test frequency, test method, equipment calibration, and acceptance/rejection criteria should be specified. A limited number of tests may fall outside the acceptable range; but generally, is limited to 3% of the total number of tests. The test must not be more than a limited amount outside the

specified moisture/density range (i.e., -2% to +3% of the acceptable moisture and no more than 5 pcf below acceptable dry density).

4) Any corrective action for an unacceptable moisture/density test. A re-test should consist of three consecutive passing tests in the vicinity of a questionable or unacceptable test, or the area should be re-worked or replaced with suitable material, then retested. The corrective action and retest should be documented.

5) Submission of record drawings showing dimensions and tests locations. Record drawings should be submitted as part of the construction report with the Certification of Completion. Specify who develops the record drawings and when provided to the owner.

Any penetrations made during testing or sampling of the soil liner should be repaired by backfilling with soil liner material, granular or pelletized bentonite, or a mixture of the soil and bentonite. Approximately two-inch loose lifts of the backfill should be placed and tamped into place. Repeat this step until the penetration is filled with compacted material.

GEOMEMBRANE INSTALLATION (FML)

Many installers, vendors, or manufacturers have written their own quality assurance plans. These may be submitted to the Department as the CQA plan. or part of the CQA plan, for installation of a geomembrane liner.

The plan should include the following specified items:

1) Specification of the material properties of the FML and documentation that the material received on-site meets the design requirements.

2) A definition of methods to resolve any conflicts or outstanding issues and to coordinate installation. Resolution of design and installation issues generally involve CQA personnel, the installer, other contractors, owner or operator of the animal feeding operation, and the designer.

3) A description of acceptable means of seaming, and seaming materials, such as chemical seaming compounds or HDPE materials for extrusion welding of HDPE. Verification methods of seaming materials used is to be included.

4) Verification methods for the seaming and a clear statement of any seam testing. Generally, 100% of the seams are non-destructively tested, and randomly tested by destruction test. Clearly describe test acceptance/rejection criteria, and corrective actions for failed seams.

5) Submission of record drawings, showing panel locations, panel dimensions, panel and seam identification, location of destructive test samples, and patch-and-repair locations. Record drawings should be submitted as part of the construction report with the Certification of Completion. Specify who develops the record drawings and when provided to the owner.

ELEVATIONS AND LOCATIONS

Information on dimensions, elevations, and locations may be included on the application drawings. If the construction is to vary more than specified in the approved application, prior approval of the change will be necessary from the Department of Environmental Quality.

Spatial locations should be specified with normal construction tolerances for variations; such as, "The northwest corner of lagoon number 1 will be located within 10 feet of the location shown on drawing 1; the floor elevation will be 1501 feet, + or - .5 ft., top dimensions will be as shown on drawing 1, + or - 5 ft.," etc.

Based on review of the CQA plan, verification testing of the constructed liner may be required by the Department. For earthen liners, this may include testing of undisturbed samples obtained from the liner. For minimum verification testing for earthen liners when a CQA plan is not provided, see "Guideline for Post-Construction Liner Test."

Additional information can be found in EPA Technical Guidance, Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182.